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Plankton of the Bermuda Oceanographic Expeditions.

II. Notes on Protozoa¹.

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(Plates I & II).

This is one of a number of papers dealing with the planktonic contents of a selected series of nets drawn at various levels off the coast of Bermuda on the Bermuda Oceanographic Expeditions of the New York Zoological Society under the direction of Dr. William Beebe. Full details of the nets, locality, etc., will be found in ZOOLOGICA, Volume XIII, Numbers 1, 2 and 3, and Volume XXI, Numbers 3 and 4.

The following 39 species of Protozoa were taken in these nets:

PHYLUM PROTOZOA.

Subphylum Mastigophora.

Class Phytomastigoda.

Order Chrysomanadida.

Family Silicoflagellidae.

Dictyocha fibula (Ehrenberg). Rare.

Order Dinoflagellida. (Dinoflagellates).

Suborder Diniferina.

Family Noctilucidae.

Noctiluca scintillans (McCartney). Rare.

Family Peridinidae.

Goniodoma polyhedricum (Pouchet).*Gonyaulax digitale* (Pouchet).*Peridiniopsis asymmetrica* Mangin.*Peridinium cerasus* Paulsen.*Peridinium claudicans* Paulsen.*Peridinium conicum* (Gran).*Peridinium grani* Ostefeld.*Peridinium oblongum* (Aurivillius).*Ceratium fusus* (Ehrenberg).*Ceratium trichocerus* (Ehrenberg).*Ceratium tripos* var. *atlantica* Ostefeld.*Ceratium karsteni* Pavillard.

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Suborder Adinina.

Family Prorocentridae.

Prorocentrum micans Ehrenberg.

The dinoflagellates live in the upper layers of the ocean; most of the species recorded above were captured in surface hauls (Nets 1471, 1472, 1475 and 1476). They are all generally distributed in the North Atlantic ocean, none being purely tropical species.

Subphylum Sarcodina.

Class Actinopoda.

Subclass Radiolaria.

The Radiolaria occurred very sparsely in the deep-water hauls and the majority of individuals were mutilated or fragmentary. Probably nearly twenty species are represented. The material awaits further study.

Subphylum Infusoria.

Class Ciliata.

Order Heterotricha.

Suborder Tintinnoinea.

Examination of Haul 779 made in 800 fathoms and upward, 8 miles south of Bermuda, on July 5, 1930, afforded the following list of 22 species, of Tintinnids, except *Tintinnopsis bermudensis*.

No species occurred numerously and all (except *Parundella major*) have been recorded previously from either the tropical Atlantic, including the Sargasso sea, North Atlantic or Mediterranean sea.

Parundella major was first described in 1925 from the Strait of Georgia, British Columbia, and has also been recorded off San Francisco.

Tintinnopsis bermudensis occurred fairly numerously and was the only species observed in Surface Hauls 1355 and 1370 taken on Sept. 17 and 24, 1933 (close to the shore of Bermuda over depths of five fathoms or less). In 16 similar hauls taken from Sept. 27 to Nov. 11, 1933, no species of tintinnid was seen.

In the accompanying plates figures are given of the species as here recorded.

An examination of 24 hauls made during September, 1930, at depths from 100 fathoms to 1,000 fathoms, 8 miles off Bermuda, disclosed no tintinnids as present. Neither were any present in two surface hauls made at the same time and place.

For information on the synonymy and distribution of the species, the conspectus of this suborder by Kofoid and Campbell (University of California Press, Vol. 34, pp. 1-403, 697 Figs. in text, 1929) should be consulted.

Family Codonellidae Kofoid and Campbell.

Tintinnopsis Stein emended.

T. bermudensis Brandt. (Fig. 1).

T. cylindrica Daday. (Fig. 2). Generally distributed.

T. major Meunier. North Atlantic.

Codonella Haeckel emended.

C. amphorella Biedermann. (Fig. 5).

C. angusta Kofoid and Campbell. Sargasso sea.

C. apicata Kofoid and Campbell (Fig. 4).

C. nationalis Brandt. (Fig. 7). Atlantic ocean.

- C. oceanica* Brandt emended. (Fig. 8). Gulf Stream.
C. rapa Kofoid and Campbell. (Fig. 6).
C. recta Kofoid and Campbell. Agulhas Current.

Family Codonellopsidae Kofoid and Campbell.

Stenosemella Jörgensen.

- S. ventricosa* (Claparède and Lachmann). (Fig. 3).

Codonellopsis Jörgensen.

- C. longa* Kofoid and Campbell. (Fig. 17).

- C. tessellata* (Brandt). (Fig. 16). Sargasso sea.

Family Cyttarocylidae Kofoid and Campbell.

Cyttarocylis Fol emended.

- C. magna* Brandt. (Fig. 15).

- C. plagiostoma* (Daday). (Fig. 18). Atlantic ocean.

Family Ptychocylidae Kofoid and Campbell.

Epiplocylis Jörgensen.

- E. sargassensis* (Brandt) emended. (Fig. 9).

Family Xystonellidae Kofoid and Campbell.

Parundella Jörgensen emended.

- P. major* Wailes. (Fig. 20). Off west coast of North America.

Family Undellidae Kofoid and Campbell.

Proplectella Kofoid and Campbell.

- P. acuta* Jörgensen. (Fig. 11). Mediterranean sea.

- P. claparèdei* (Entz Sr.). (Fig. 10).

Family Dictyocystidae Haeckel emended.

Dictyocysta Ehrenberg emended.

- D. dilatata* Brandt. (Figs. 12, 13). Sargasso sea.

- D. lata* Kofoid and Campbell. (Fig. 14). Sargasso sea.

Family Tintinnidae Claparède and Lachmann emended.

Tintinnus Schrank emended.

- T. macilentus* Jörgensen emended. (Fig. 19). North Atlantic,
New Zealand.

Order Peritrichida.

Family Vorticellidae.

Cothurnia imberbis Ehrenberg.

Class Suctoria.

Family Acinetidae.

Acineta tuberosa Ehrenberg

The last two species were attached to floating alga. They are littoral forms and generally distributed.

EXPLANATION OF THE PLATES.

Note: All Figures magnified 375 times.

PLATE I.

- Fig. 1. *Tintinnopsis bermudensis* Brandt. Total length 84-94 μ , greatest diameter 60-68 μ , diameter of collar 45 μ .
- Fig. 2. *Tintinnopsis cylindrica* Daday. Diameter 38-40 μ , length 140-150 μ .
- Fig. 3. *Stenosemella ventricosa* (Claparède & Lachmann). Length 68-83 μ , diameter 55-68 μ .
- Fig. 4. *Codonella apicata* Kofoid & Campbell. Length 75 μ , greatest diameter 59 μ , diameter of collar 42 μ , height of collar 16 μ .
- Fig. 5. *Codonella amphorella* Biedermann. Length 89-98 μ , greatest diameter 55 μ , length of horn, 18-26 μ , length of collar 22-23 μ , diameter of neck 36-40 μ .
- Fig. 6. *Codonella rapa* Kofoid & Campbell. Length 90-96 μ , greatest diameter 49-50 μ , length of horn 20 μ , length of collar 23 μ .
- Fig. 7. *Codonella nationalis* Brandt. Length 74-84 μ , greatest diameter 55-64 μ , length of collar 19-20 μ .
- Fig. 8. *Codonella oceanica* Brandt emended. Length 84 μ , greatest diameter 66 μ .
- Fig. 9. *Epiplocylis sargassensis* Brandt emended. Length 132 μ , greatest diameter 70 μ .
- Fig. 10. *Proplectella claparèdei* (Entz Sr.). Length 58-65 μ , greatest diameter 40-42 μ , aperture 36 μ .
- Fig. 11. *Proplectella acuta* Jörgensen. Length 68 μ , diameter 39 μ , aperture 33 μ .
- Figs. 12, 13. *Dictyocysta dilatata* Brandt. Length 61-65 μ , diameter 40-45 μ , diameter of collar 34-39 μ , height of collar 16 μ .
- Fig. 14. *Dictyocysta lata* Kofoid & Campbell. Length 65 μ , diameter of bowl 53 μ , diameter of collar 50 μ , height of collar 30 μ .

PLATE II.

- Fig. 15. *Cyttarocylis magna* Brandt. Length 268 μ , greatest diameter 130 μ .
- Fig. 16. *Codonellopsis tessalata* (Brandt). Length of bowl and neck 80 μ , diameter of bowl 68-70 μ , diameter of neck 42-52 μ , length of horn 32-42 μ , total length up to about 225 μ .
- Fig. 17. *Codonellopsis longa* Kofoid & Campbell. Total length 235 μ , greatest diameter of bowl 65 μ .
- Fig. 18. *Cyttarocylis plagiostoma* (Daday). Length 106-123 μ , diameter of aperture 105-117 μ .
- Fig. 19. *Tintinnus macilentus* Jörgensen emended. Length 160 μ , oral aperture 38 μ diameter, aboral aperture 24 μ diameter.
- Fig. 20. *Parundella major* Wailes. Diameter 30-32 μ , length 130-136 μ .